

IN THE CLAIMS:

The following is a complete listing of the claims in this application, reflects all changes currently being made to the claims, and replaces all earlier versions and all earlier listings of the claims:

1. (Currently amended) An ink jet printing apparatus for forming an image on a print medium by using a print head, the print head having a plurality of ~~nozzle groups, each having a plurality of nozzles~~ nozzles for printing a same color, the ink jet printing apparatus comprising:

[[an]] image forming means for performing a plurality of main scans by scanning the print head relatively ~~with respect~~ to a same main scan print area of the print medium and for forming the image onto the same main scan print area by using different respective nozzles ~~nozzle groups~~ of the print head in the plurality of main scanning operations, wherein different thinning out mask patterns are used in the plurality of main scanning operations for printing onto the same main scan print area, and [[a]] thinned out images according to the different thinning out mask patterns [[is]] are formed onto the same main scan print area by the different respective nozzles ~~nozzle groups~~ during the plurality of main scanning operations; and

[[a]] printing duty determining means for dividing the same main scan print area into a plurality of divided areas in a sub-scan direction different from a main scan direction, and for determining the printing duty of each of the plurality of divided areas, in each of the plurality of main scanning operations, the printing duty being determined ~~from~~ by the thinning out mask pattern,

wherein the printing duty determining means performs the thinning out process by the thinning out mask pattern ~~so~~ such that the printing duty of one of the divided areas and the printing duty of ~~another~~ a second one of the divided areas are different from each other in each of the plurality of the main scanning operations, and the printing duty for the same main scan print area in the main scanning operation in which are used nozzles including an end nozzle of the print head is less than the print duty for the same main scan print area in another main scanning operation in which the end nozzle of the print head is not used.

2. (Currently amended) An ink jet printing apparatus according to claim 1, ~~wherein the printing duty determining means determines the printing duties of the divided areas in the same main scan print area situated at the ends of the print head to smaller values than those of the divided areas situated on the inner side of the ends of the print head, the same main scan print area being formed by the plurality of the main scans~~ wherein the one of the divided areas is closer to the end nozzle than is the second of the divided areas, and

wherein the print duty determining means determines the respective printing duties of the one and the second divided areas such that the printing duty in the one of the divided areas is less than the printing duty of the second of the divided areas in each of the plurality of the main scanning operations.

3. (Original) An ink jet printing apparatus according to claim 1, wherein the thinning out mask pattern has a lower resolution than that of an image being printed.

4. (Original) An ink jet printing apparatus according to claim 1,
wherein the thinning out mask pattern is a pseudo-periodical mask
pattern in which, when pixels are digitized according to an arbitrary level, unprinted pixels and
printed pixels are uniformly distributed.
5. (Original) An ink jet printing apparatus according to claim 1, wherein
the print head has a plurality of nozzle columns corresponding to color inks and ejects ink
droplets according to color print data to form a color image.
6. (Original) An ink jet printing apparatus according to claim 1, further
including a striped density variation amount detection means for detecting an amount of striped
density variation occurring in an image formed by the print head, wherein the striped density
variation amount detection means has a control unit to cause the print head to print a
predetermined test image, a reading unit to read the printed test image by using an optical sensor,
a calculation unit to determine the amount of striped density variation of the print head based on
the result of the reading, and a register to store the calculated result produced by the calculation
unit.
7. (Original) An ink jet printing apparatus according to claim 1, wherein
an amount of ink ejected from each nozzle of the print head in one ejection operation is 4 pl or
less.

8. (Original) An ink jet printing apparatus according to claim 1, wherein dots formed by ink ejected from each nozzle of the print head in one ejection operation have an average diameter of 50 μm or less.

9. (Original) An ink jet printing apparatus according to claim 1, wherein the print head forms dots at a print density of 600 dpi or higher.

10. (Original) An ink jet printing apparatus according to claim 1, wherein the print head generates bubbles in ink by thermal energy and ejects ink by a pressure of the bubbles.

11. (Currently amended) An ink jet printing method for forming an image on a print medium by using a print head, the print head having a plurality of ~~nozzle groups, each having a plurality of nozzles~~ nozzles, the ink jet printing method comprising the steps of:

performing a plurality of main scans by scanning the print head relatively ~~with respect~~ to a same main scan print area of the print medium and forming the image onto the same main scan print area by using different respective nozzles ~~nozzle groups~~ of the print head in the plurality of main scanning operations, wherein different thinning out mask patterns are used in the plurality of main scanning operations, for printing onto the same main scan print area, and ~~[[a]] thinned out images~~ according to the different thinning out mask patterns ~~[[is]]~~ are formed onto the same main scan print area by the different respective nozzles ~~nozzle groups~~ during the plurality of main scanning operations; and

dividing the same main scan print area into a plurality of divided areas in a sub-scan direction different from a main scan direction, and determining the printing duty of each of the plurality of divided areas, in each of the plurality of main scanning operations, the printing duty being determined [[from]] by the thinning out mask pattern,

wherein the printing duty of one of the divided areas and the printing duty of ~~another~~ a second one of the divided areas are different from each other in each of the plurality of the main scanning operations, and the printing duty for the same main scan print area in the main scanning operation in which are used nozzles including an end nozzle of the print head is less than the print duty for the same main scan print area in another main scanning operation in which the end nozzle of the print head is not used.

12. (Original) An ink jet printing method according to claim 11, wherein, of the same main scan print area formed by a plurality of main scans, the divided areas corresponding to the ends of the print head have their printing duties set smaller than those of the divided areas on the inner side of the ends of the print head.

13. (Original) An ink jet printing method according to claim 11, wherein the thinning out mask pattern has a lower resolution than that of an image being printed.

14. (Original) An ink jet printing method according to claim 11, wherein the thinning out mask pattern is a pseudo-periodical mask pattern in which, when pixels are

digitized according to an arbitrary level, unprinted pixels and printed pixels are uniformly distributed.

15. (Original) An ink jet printing method according to claim 11, wherein the print head has a plurality of nozzle columns corresponding to color inks and ejects ink droplets according to color print data to form a color image.

16. (Currently amended) An ink jet printing method according to claim 11, further including a step of detecting an amount of striped density variation occurring in an image formed by the print head, wherein the striped density variation amount detection step ~~has~~ includes a step of causing the print head to print a predetermined test image, a step of reading the printed test image by using an optical sensor, a calculation step of determining the amount of striped density variation of the print head based on the result of the reading, and a step of storing the calculated result produced by the calculation step.

17. (Original) An ink jet printing method according to claim 11, wherein the print head generates bubbles in ink by thermal energy and ejects ink by a pressure of the bubbles.

18. (Currently amended) A printing control method for an ink jet printing apparatus, the ink jet printing apparatus having a plurality of nozzles ~~nozzle groups, each having~~

~~a plurality of nozzles~~; for printing a same color, the printing control method comprising the steps of:

providing the printing apparatus;

performing a plurality of main scans by scanning the print head relatively ~~with respect~~ to a same main scan print area of the print medium and forming the image onto the same main scan print area by using different respective nozzles ~~nozzle groups~~ of the print head in the plurality of main scanning operations, wherein different thinning out mask patterns are used in the plurality of main scanning operations, for printing onto the same main scan print area, and ~~[[a]] thinned out images~~ according to the different thinning out mask patterns ~~[[is]]~~ are formed onto the same main scan print area by the different respective nozzles ~~nozzle groups~~ during the plurality of main scanning operations; and

dividing the same main scan print area into a plurality of divided areas in a sub-scan direction different from a main scan direction, and determining the printing duty of each of the plurality of divided areas, in each of the plurality of main scanning operations, the printing duty being determined ~~[[from]]~~ by the thinning out mask pattern,

wherein the printing duty of one of the divided areas and the printing duty of ~~another~~ a second one of the divided areas are different from each other in each of the plurality of the main scanning operations, and the printing duty for the same main scan print area in the main scanning operation in which are used nozzles including an end nozzle of the print head is less than the print duty for the same main scan print area in another main scanning operation in which the end nozzle of the print head is not used.

19. (Currently amended) An ink jet printing apparatus for forming an image on a print medium by using a print head, the print head having a plurality of nozzle groups, each having a plurality of nozzles for printing a same color, the ink jet printing apparatus comprising:

image formation means for performing a plurality of main scans by scanning the ~~ink jet head~~ print head relatively ~~with respect~~ to a same main scan print area of the print medium and for forming the image onto the same main scan print area by using different nozzle groups of the ~~ink jet head~~ print head in the plurality of scanning operations, wherein different thinning out mask patterns are used in the plurality of scanning operations for printing onto the same main scan print area, and a thinned out image according to the different thinning out mask patterns is formed onto the same main scan print area by the different nozzle groups during the plurality of scanning operations; and

printing duty determining means for dividing the same scan print area into a plurality of divided areas in a sub-scan direction different from a main scan direction, and for determining the printing duty of each of the plurality of divided areas, the printing duty being determined from the thinning out mask pattern,

wherein the printing duty determining means performs the thinning out process by the thinning out mask pattern ~~so~~ such that the printing duty of one of the divided areas and the printing duty of ~~another~~ a second one of the divided areas are different from each other,

wherein the thinning out mask pattern is a pseudo-periodical mask pattern in which, when pixels are digitized according to an arbitrary level, unprinted pixels and printed pixels are uniformly distributed.

20. (Currently amended) An ink jet printing apparatus for forming an image on a print medium by using a print head, the print head having a plurality of nozzle groups, each having a plurality of nozzles for printing a same color, the ink jet printing apparatus comprising:

image formation means for performing a plurality of main scans by scanning the ~~ink jet head~~ print head ~~relatively with respect~~ to a same main scan print area of the print medium and for forming the image onto the same main scan print area by using different nozzle groups of the ~~ink jet head~~ print head in the plurality of scanning operations, wherein different thinning out mask patterns are used in the plurality of scanning operations for printing onto the same main scan print area, and a thinned out image according to the different thinning out mask patterns is formed onto the same main scan print area by the different nozzle groups during the plurality of scanning operations; and

printing duty determining means for dividing the same scan print area into a plurality of divided areas in a sub-scan direction different from a main scan direction, and for determining the printing duty of each of the plurality of divided areas, the printing duty being determined from the thinning out mask pattern,

wherein the printing duty determining means performs the thinning out process by the thinning out mask pattern ~~so~~ such that the printing duty of one of the divided areas and the printing duty of ~~another~~ a second one of the divided areas are different from each other,

wherein the apparatus further includes a striped density variation amount detection means for detecting an amount of striped density variation occurring in an image formed by the print head, wherein the striped density variation amount detection means

has a control unit to cause the print head to print a predetermined test image, a reading unit to read the printed test image by using an optical sensor, a calculation unit to determine the amount of striped density variation of the print head based on the result of the reading, and a register to store the calculated result produced by the calculation unit.

21. (Currently amended) An ink jet printing method for forming an image on a print medium by using a print head, the print head having a plurality of nozzle groups, each having a plurality of nozzles, the ink jet printing method comprising the steps of:

performing a plurality of main scans by scanning the ~~ink jet head~~ print head ~~relatively with respect to a same main scan print area of the print medium and forming the image onto the same main scan print area by using different nozzle groups of the ink jet head~~ print head in the plurality of scanning operations, wherein different thinning out mask patterns are used in the plurality of scanning operations for printing onto the same main scan print area, and a thinned out image according to the different thinning out mask patterns is formed onto the same main scan print area by the different nozzle groups during the plurality of scanning operations, and dividing the same scan print area into a plurality of divided areas in a sub-scan direction different from a main scan direction, and determining the printing duty of each of the plurality of divided areas, the printing duty being determined from the thinning out mask pattern,

wherein, the printing duty of one of the divided areas and the printing duty of ~~another~~ a second one of the divided areas are different from each other,

wherein, the thinning out mask pattern is a pseudo-periodical mask pattern in which, when pixels are digitized according to an arbitrary level, unprinted pixels and printed pixels are uniformly distributed.

22. (Currently amended) An ink jet printing method for forming an image on a print medium by using a print head, the print head having a plurality of nozzle groups, each having a plurality of nozzles, the ink jet printing method comprising the steps of:

performing a plurality of main scans by scanning the ~~ink-jet-head~~ print head relatively ~~with respect~~ to a same main scan print area of the print medium and forming the image onto the same main scan print area by using different nozzle groups of the ~~ink-jet-head~~ print head in the plurality of scanning operations, wherein different thinning out mask patterns are used in the plurality of scanning operations for printing onto the same main scan print area, and a thinned out image according to the different thinning out mask patterns is formed onto the same main scan print area by the different nozzle groups during the plurality of scanning operations, and dividing the same scan print area into a plurality of divided areas in a sub-scan direction different from a main scan direction, and determining the printing duty of each of the plurality of divided areas, the printing duty being determined from the thinning out mask pattern,

wherein, the printing duty of one of the divided areas and the printing duty of ~~another~~ a second one of the divided areas are different from each other,

wherein the method also includes a step of detecting an amount of striped density variation occurring in an image formed by the print head, wherein the striped density variation amount detection step has a step of causing the print head to print a

predetermined test image, a step of reading the printed test image by using an optical sensor, a calculation step of determining the amount of striped density variation of the print head based on the result of the reading, and a step of storing the calculated result produced by the calculation step.

23. (Currently amended) An ink jet printing apparatus for forming an image on a print medium by using a print head, the print head having a plurality of nozzle groups, each having a plurality of nozzles for printing a same color, the ink jet printing apparatus comprising:

means for performing a plurality of main scans by scanning the print head relatively ~~with respect~~ to a same ~~main scan~~ print area of the print medium; and

means for forming ~~[[a]]~~ thinned out images according to different thinning out mask patterns onto the same ~~main scan~~ print area by using different respective nozzle groups of the print head in ~~each of~~ the plurality of scanning operations, each of the different thinning out mask patterns being used in each of the plurality of scanning operations for printing onto the same main scan print area~~[[:]]~~,

wherein, among the different thinning out mask patterns, a thinning out rate of the thinning out mask pattern to be used when the nozzle group including an end nozzle of the print head performs the main scanning operation onto the same print area is larger than a thinning out rate of the thinning out mask pattern to be used when the nozzle group excluding the end nozzle of the print head performs the main scanning operation onto the same print area, and

wherein each of different thinning out mask patterns has a plurality of ~~areas~~ portions corresponding to each of a plurality of areas obtained by dividing the same main scan print area in a sub-scan direction different from a main scan direction and, among the plurality of portions, a thinning out rate for one portion differs from that for a second portion.

~~wherein each of the plurality of areas portions in the thinning out mask pattern has having thinning out rates and the thinning out rate of one of the areas and the thinning out rate of another of the areas are different from each other.~~

24. (Currently amended) An ink jet printing method for forming an image on a print medium by using a print head, the print head having a plurality of nozzle groups, each having a plurality of nozzles for printing a same color, the ink jet printing apparatus comprising the steps of:

performing a plurality of main scans by scanning the print head relatively ~~with respect~~ to a same ~~main scan~~ print area of the print medium; and

forming ~~[[a]]~~ thinned out images according to different thinning out mask patterns onto the same ~~main scan~~ print area by using different nozzle groups of the print head in ~~each of~~ the plurality of scanning operations, each of the different thinning out mask patterns being used in each of the plurality of scanning operations for printing onto the same main scan print area~~[[:]]~~,

wherein, among the different thinning out mask patterns, a thinning out rate of the thinning out mask pattern to be used when the nozzle group including an end nozzle of the print head performs the main scanning operation onto the same print area is larger than the

thinning out rate of the thinning out mask pattern to be used when the nozzle group excluding the end nozzle performs the main scanning operation onto the same print area, and

wherein each of different thinning out mask patterns has a plurality of portions corresponding to each of a plurality of areas obtained by dividing the same main scan print area in a sub-scan direction different from a main scan direction, and, among the plurality of portions, a thinning out rate for one portion differs from that for a second portion.

25. (Currently amended) An ink jet printing apparatus for forming an image on a print medium by using a print head having a plurality of nozzles for ejecting ink of a same color, the ink jet printing apparatus comprising:

means for performing a plurality of main scans by scanning the print head relatively with respect to a ~~[[same]]~~ predetermined print area of the print medium; and

means for forming ~~[[a]]~~ thinned out images according to ~~[[a]]~~ different thinning out masks onto the ~~[[same]]~~ predetermined print area by using ~~[[a]]~~ different respective nozzles of the print head in ~~each of the plurality of main scanning operations, the different thinning out mask being used in each of the plurality of scanning operations for printing onto the same print area,~~

wherein each of the different thinning out masks has a plurality of portions for thinning out image data corresponding to ~~each~~ respective ones of a plurality of divided areas obtained by dividing the ~~[[same]]~~ predetermined print area in a sub-scan direction different from a main scan direction, ~~[[and]]~~

wherein the plurality of portions includes at least a first portion corresponding to one of the divided areas relatively close to an end nozzle of the print head and a second portion corresponding to another of the divided areas relatively far from the end nozzle of the print head, and a thinning out rate of the first portion is larger than that of the second portion, and

~~wherein the thinning out rate of one of the plurality of portions in the thinning out mask and the thinning out rate of another of the plurality of portions are different from each other~~

wherein, among the different thinning out masks, the thinning out rate of the thinning out mask to be used when the end nozzle of the print head performs the main scanning operation onto the predetermined print area is larger than the thinning out rate of a another thinning out mask to be used when nozzles other than the end nozzle performs the main scanning operation onto the predetermined print area.

26. (Currently amended) An ink jet printing apparatus for forming an image on a print medium by using a print head having a plurality of nozzles for ejecting ink of a same color, the ink jet printing apparatus comprising:

means for performing a plurality of main scans by scanning the print head ~~relatively with respect~~ to a same print area of the print medium; and

means for forming ~~[[a]]~~ thinned out images according to different thinning out masks onto the same print area by using different respective nozzles of the print

head in ~~each of the plurality of main scanning operations, the different thinning out mask being used in each of the plurality of scanning operations for printing onto the same print area;~~

wherein each of the different thinning out masks is defined so that respective print duties (thinning out rates) corresponding to each respective ones of a plurality of divided areas obtained by dividing the same [[main]] scan print area in a sub-scan direction different from a main scan direction are different from each other, and the thinning out rate for divided area close to an end nozzle of the print head is larger than that for divided area far from the end nozzle of the print head, and

wherein, the thinning out rate of each of the different thinning out masks is defined so that the thinning out rate for the same print area in a main scanning operation in which nozzles including an end nozzle of the print head are used, is larger than the thinning out rate for the same print area in another main scanning operation in which the end nozzle of the print head is not used.

27. (Currently amended) An ink jet printing apparatus for forming an image on a print medium by using a print head having a plurality of nozzles for ejecting ink of a same color, the ink jet printing apparatus comprising:

means for performing a plurality of main scans by scanning the print head ~~relatively with respect~~ to a same print area of the print medium; and

means for forming [[a]] thinned out images according to [[a]] different thinning out masks onto the same print area by using [[a]] different respective nozzles of the

print head in ~~each of the plurality of main scanning operations, the different thinning out mask being used in each of the plurality of scanning operations for printing onto the same print area,~~
wherein each of the different thinning out masks is defined so that respective printable duties (thinning out rates) corresponding to each of a plurality of divided areas obtained by dividing the same main scan print area in a sub-scan direction different from a main scan direction are different from each other, and the print duty for divided area close to an end nozzle of the print head is less than the print duty for the divided area far from the end nozzle of the print head, and

wherein the print duty of each of the different thinning out masks is defined so that the print duty for the same main scan area in a main scanning operation in which nozzles including an end nozzle of the print head are used, is less than the print duty for the same main scan area in another main scanning operation in which nozzles excluding the end nozzle are used.

28. (Currently amended) A recording apparatus for recording [[the]] using a recording head having a plurality of recording nozzles, said apparatus comprising:

a scanning means for scanning the recording head relative to a same record area of a recording medium a plurality of times;

a setting means for setting a plurality of different thinning-out masks as thinning-out masks used during the plurality of main scans for recording of the same record area;

a thinning out means for thinning out image data using the plurality of different thinning-out masks set by said setting means, each of the plurality of different thinning-out masks being used during each of the plurality of scans; and

a record controlling means for recording thinned-out images on the same record area in accordance with the image data thinned out by said thinning-out means, during ~~each of~~ the plurality of scans, and completing an image to be recorded on the same record area,

wherein said thinning out means thins image data in accordance with thinning masks which is set in such a manner that ~~at a different thinning-out rate, respective thinning out rates for~~ the plurality of divided areas obtained by dividing the same print area in a sub-scan direction different from a main scan direction ~~differs~~ are different from each other, ~~on the basis of the thinning out mask and~~

wherein a thinning out rate of the thinning mask to be used when the nozzles including an end nozzle of the print head perform a main scanning operation onto the same print area is larger than a thinning out rate of the thinning mask to be used when the nozzles excluding the end nozzle perform a main scanning operation onto the same print area, and in each of the plurality of the main scanning operations, the thinning out rate for the divided area close to the end nozzle of the print head is larger than the thinning out rate for the divided area far from the end nozzle.

29. (Currently amended) A recording apparatus for recording [[the]] using a recording head having a plurality of recording nozzles, said apparatus comprising:

a scanning means for scanning the recording head relative to a same record area of a recording medium a plurality of times;

a setting means for setting a plurality of different thinning-out masks as thinning-out masks used during the plurality of main scans for recording of the same record area;

a thinning out means for thinning out image data using the plurality of different thinning-out masks set by said setting means, each of the plurality of different thinning-out masks being used during each of the plurality of main scans; and

a record controlling means for recording thinned-out images on the same record area in accordance with the image data thinned out by said thinning-out means, during ~~each of~~ the plurality of scans, and completing an image to be recorded on the same record area,

wherein said thinning out means thins image data, on the basis of the thinning-out mask which is defined so that respective print duties (thinning out rates) corresponding to each of a plurality of divided areas obtained by dividing the same print area in a sub-scan direction different from a main scan direction are different from each other, and

wherein a print duty for the same print area in a main scanning operation in which nozzles including an end nozzle of the print head are used, is less than that for the same print area in another main scanning operation in which nozzles excluding the end nozzle are used, and in each of the plurality of main scanning operations, the print duty for divided area close to the end nozzle of the print head is less than that for divided area far from the end nozzle.

30. (Currently amended) A recording apparatus for recording using a recording head having a plurality of recording nozzles, said apparatus comprising:

a scanning means for scanning the recording head relative to a same record area of a recording medium a plurality of times;

a setting means for setting a plurality of different thinning-out masks as thinning-out masks used during the plurality of scans for recording of the same recording area;

a thinning out means for thinning out image data using the plurality of different thinning-out masks set by said setting means, each of the plurality of thinning-out masks being used during each of the plurality of scans; and

a record controlling means for recording thinned-out images on the same record area in accordance with the image data thinned out by said thinning-out means, during ~~each of~~ the plurality of scans, and completing an image to be recorded on the same record area,

wherein each of the different thinning-out masks has a plurality of portions for thinning-out image data corresponding to each of a plurality of divided areas obtained by dividing the same print area in a sub-scan direction different from a main scan direction, ~~and~~

wherein ~~the thinning out rates of the plurality of portions are different from each other~~ the thinning out rate for one portion of the plurality of the portions differs from that for a second portion of the plurality of the portions, and

wherein the thinning out rate of the thinning out mask to be used in a main scanning operation in which the nozzles including an end nozzle of the print head are used,

is larger than the thinning out rate for another thinning out mask to be used in a main scanning operation in which the nozzles excluding the end nozzle are used.

31. (Currently amended) A recording apparatus for recording using a recording head having a plurality of recording nozzles, said apparatus comprising:

scanning means for scanning the recording head relative to a same record area of a recording medium a plurality of times;

setting means for setting a plurality of different thinning-out masks as thinning-out masks used during the plurality of scans for recording of the same recording area;

thinning out means for thinning out image data using the plurality of different thinning-out masks set by said setting means, each of the plurality of thinning-out masks being used during each of the plurality of scans; and

record controlling means for recording thinned-out images on the same record area in accordance with the image data thinned out by said thinning-out means, during ~~each of~~ the plurality of scans, and completing an image to be recorded on the same record area,

wherein each of the different thinning-out masks is defined so that respective printable duties (thinning out rates) corresponding to [[each]] one divided area differs from that corresponding to a second one of the divided areas in [[of]] a plurality of divided areas obtained by dividing the same main scan print area in a sub-scan direction different from a main scan direction, are different from each other and

wherein the print duty of the thinning out masks to be used in a main scanning operation in which the nozzles including an end nozzle of the print head are used, is

less than the print duty of the thinning out mask to be used in another main scanning operation in which the nozzles excluding the end nozzle are used.

32. (Currently amended) An ink jet printing method for forming an image on a print medium by using a print head having a plurality of nozzles for ejecting ink of a same color, the ink jet printing method comprising the following steps:

performing a plurality of main scans by scanning the ~~ink jet head~~ print head ~~relatively with respect to a same predetermined~~ print area of the print medium; and

forming ~~[[a]] thinned out images~~ according to ~~[[a]] different thinning out masks~~ onto the ~~same predetermined~~ print area by using ~~[[a]] different~~ respective nozzles of the ~~ink jet head~~ print head ~~in each of the plurality of main scanning operations, the different thinning out mask being used in each of the plurality of scanning operations for printing onto the same print area,~~

wherein each of the different thinning out masks has a plurality of portions for thinning out image data corresponding to each of a plurality of divided areas obtained by dividing the ~~same predetermined~~ print area in a sub-scan direction different from a main scan direction, and

~~wherein the thinning out rate of one of the plurality of portions in the thinning out mask and the thinning out rate of another of the plurality of portions are different from each other~~

wherein the plurality of portions includes at least a first portion corresponding to one of the divided areas relatively close to an end nozzle of the print head and a

second portion corresponding to another of the divided areas relatively far from the end nozzle of the print head, and a thinning out rate of the first portion is larger than that of the second portion, and

wherein, among the different thinning out masks, the thinning out rate of the thinning out mask to be used when the end nozzle of the print head performs the main scanning operation onto the predetermined print area is larger than the thinning out rate of another thinning out mask to be used when nozzles other than the end nozzle perform the main scanning operation onto the predetermined print area.

33. (Currently amended) An ink jet printing method for forming an image on a print medium by using a print head having a plurality of nozzles for ejecting ink of a same color, the ink jet printing method comprising the following steps:

performing a plurality of main scans by scanning the ~~ink jet head~~ print head ~~relatively with respect~~ to a same print area of the print medium; and

forming ~~[[a]]~~ thinned out images according to a different thinning out mask onto the same print area by using a different nozzle of the ~~ink jet head~~ print head in ~~each of~~ the plurality of main scanning operations, ~~the different thinning out mask being used in each of the plurality of scanning operations for printing onto the same print area;~~

wherein each of the different thinning out masks is defined so that thinning out rates corresponding to each of a plurality of divided areas obtained by dividing the same ~~main~~ scan print area in a sub-scan direction different from a main scan direction are

different from each other, and the thinning out rate for divided area close to an end nozzle of the print head is larger than that for divided area far from the end nozzle of the print head, and

wherein, thinning out rate of each of the different thinning out masks is defined so that the thinning out rate for the same print area in a main scanning operation in which nozzles including an end nozzle of the print head are used, is larger than the thinning out rate for the same print area in another main scanning operation in which the end nozzle of the print head is not used.

34. (Currently amended) An ink jet printing method for forming an image on a print medium by using a print head having a plurality of nozzles for ejecting ink of a same color, the ink jet printing method comprising the following steps:

performing a plurality of main scans by scanning the ~~ink jet head~~ print head relatively ~~with respect~~ to a same print area of the print medium; and

forming ~~[[a]]~~ thinned out images according to ~~[[a]]~~ different thinning out masks onto the same print area by using ~~[[a]]~~ different respective nozzles of the ~~ink jet head~~ print head in ~~each of the plurality of main scanning operations, the different thinning out mask being used in each of the plurality of scanning operations for printing onto the same print area;~~

wherein each of the different thinning out masks is defined so that ~~printable~~ duties corresponding to each of a plurality of divided areas obtained by dividing the same main scan print area in a sub-scan direction different from a main scan direction are different from each other, and the print duty for divided area close to an end nozzle of the print head is less than the print duty for the divided area far from the end nozzle of the print head, and

wherein the print duty of each of the different thinning out masks is defined so that the print duty for the same main scan area in a main scanning operation in which nozzles including an end nozzle of the print head are used, is less than the print duty for the same main scan area in another main scanning operation in which the end nozzle of the printhead is not used.

35. (Currently amended) A recording method for recording ~~the~~ using a recording head having a plurality of recording nozzles, said method comprising the following steps:

scanning the recording head relative to a same record area of a recording medium a plurality of times;

setting a plurality of different thinning-out masks as thinning-out masks used during the plurality of main scans for recording of the same record area;

thinning out image data using the plurality of different thinning-out masks set by said setting step, each of the plurality of different thinning-out masks being used during each of the plurality of scans; and

recording thinned-out images on the same record area in accordance with the image data thinned out by said thinning-out step, during ~~each of~~ the plurality of scans, and completing an image to be recorded on the same record area,

wherein said thinning out step thins ~~at a different thinning-out rate,~~
~~each thinning-out image data corresponding to each of a~~ image data in accordance with thinning masks which is set in such a manner that respective thinning out rates for the plurality of divided

areas obtained by dividing the same print area in a sub-scan direction different from a main scan direction ~~differs~~ are different from each other, ~~on the basis of the thinning-out mask and~~

wherein a thinning out rate of the thinning mask to be used when the nozzles including an end nozzle of the print head perform a main scanning operation onto the same print area is larger than a thinning out rate of the thinning mask to be used when the nozzles excluding the end nozzle perform a main scanning operation onto the same print area, and in each of the plurality of the main scanning operations, the thinning out rate for the divided area close to the end nozzle of the print head is larger than the thinning out rate for the divided area far from the end nozzle.

36. (Currently amended) A recording method for recording ~~the~~ using a recording head having a plurality of recording nozzles, said method comprising the following steps:

scanning the recording head relative to a same record area of a recording medium a plurality of times;

setting a plurality of different thinning-out masks as thinning-out masks used during the plurality of main scans for recording of the same record area;

thinning out image data using the plurality of different thinning-out masks set by said setting step, each of the plurality of different thinning-out masks being used during each of the plurality of main scans; and

recording thinned-out images on the same record area in accordance with the image data thinned out by said thinning-out step, during ~~each of~~ the plurality of scans, and completing an image to be recorded on the same record area,

wherein said thinning out step thins image data, on the basis of the thinning-out mask which is defined so that ~~thinning-out rates~~ print duties corresponding to each of a plurality of divided areas obtained by dividing the same print area in a sub-scan direction different from a main scan direction are different from each other, and

wherein a print duty for the same print area in a main scanning operation in which nozzles including an end nozzle of the print head are used, is less than that for the same print area in another main scanning operation in which the nozzles excluding the end nozzle are used, and in each of the plurality of main scanning operations, the print duty for divided area close to the end nozzle of the print head is less than that for divided area far from the end nozzle.

37. (Currently amended) A recording method for recording using a recording head having a plurality of recording nozzles, said method comprising the following steps:

scanning the recording head relative to a same record area of a recording medium a plurality of times;

setting a plurality of different thinning-out masks as thinning-out masks used during the plurality of scans for recording of the same record area;

thinning out image data using the plurality of different thinning-out masks set by said setting step, each of the plurality of thinning-out masks being used during each of the plurality of scans; and

recording thinned-out images on the same record area in accordance with the image data thinned out by said thinning-out step, during ~~each of~~ the plurality of scans, and completing an image to be recorded on the same record area,

wherein each of the different thinning-out mask has a plurality of portions for thinning-out image data corresponding to each of a plurality of divided areas obtained by dividing the same print area in a sub-scan direction different from a main scan direction, and

wherein ~~the thinning out rates of the plurality of portions are different from each other~~ the thinning out rate for one portion of the plurality of the portions differs from that for a second portion of the plurality of the portions, and

wherein the thinning out rate of the thinning out mask to be used in a main scanning operation in which the nozzles including an end nozzle of the print head are used, is larger than the thinning out rate for another thinning out mask to be used in a main scanning operation in which the nozzles excluding the end nozzle are used.

38. (Currently amended) A recording method for recording using a recording head having a plurality of recording nozzles, said method comprising the following steps:

scanning the recording head relative to a same record area of a recording medium a plurality of times;

setting a plurality of different thinning-out masks as thinning-out masks used during the plurality of scans for recording of the same record area;

thinning out image data using the plurality of different thinning-out masks set by said setting step, each of the plurality of thinning-out masks being used during each of the plurality of scans; and

recording thinned-out images on the same record area in accordance with the image data thinned out by said thinning-out step, during ~~each of~~ the plurality of scans, and completing an image to be recorded on the same record area,

wherein each of the different thinning-out masks is defined so that printable duty corresponding to ~~[[each]] one divided area differs from that corresponding to a second one of the divided areas in~~ [[of]] a plurality of divided areas obtained by dividing the same main scan print area in a sub-scan direction different from a main scan direction, are different from each other and

wherein the print duty of the thinning out mask to be used in a main scanning operation in which the nozzles including an end nozzle of the print head are used, is less than the print duty of the thinning out mask to be used in another main scanning operation in which the nozzles excluding the end nozzle are used.

39. (New) A recording apparatus for recording using a recording head having a plurality of recording nozzles, said apparatus comprising:

scanning means for scanning the recording head relative to a same record area of a recording medium a plurality of times;

setting means for setting a plurality of different thinning-out mask patterns as thinning-out mask patterns used in the plurality of scans for recording of the same recording area;

thinning-out means for thinning out image data using the plurality of different thinning-out mask patterns set by said setting means, each of the plurality of thinning-out mask patterns being used in each of the plurality of scans; and

record control means for recording thinning-out images on the same record area in accordance with the image data thinned out by said thinning-out means during each of the plurality of scans, thereby completing an image to be on the same record area,

wherein a print duty of the thinning-out mask pattern to be used when the nozzles including an end nozzle of the print head perform a main scan onto the same record area is less than a print duty of the thinning-out mask pattern to be used when the nozzles excluding the end nozzle perform another scan onto the same record area, and

wherein each of the different thinning-out mask patterns is defined so that a print duty corresponding to one divided area differs from that corresponding to another divided area in a plurality of divided areas obtained by dividing the same record area in the sub-scan direction different from a main scan direction and a print duty corresponding to a divided area close to the end nozzle is less than that corresponding to a divided area far from the end nozzle in a plurality of divided areas.

40. (New) A recording apparatus according to claim 39, wherein a print duty corresponding to a divided area positioned far from an end nozzle in the thinning-out mask patterns to be used when nozzles including the end nozzle of the print head perform a main scan onto the same record area is confined below a print duty corresponding to a divided area positioned close to the end nozzle in the thinning-out mask patterns to be used when nozzles excluding the end nozzle of the recording head perform the main scan onto the same record area.

41. (New) A recording method for recording using a recording head having a plurality of recording nozzles, said method comprising the steps of:

scanning the recording head relative to a same record area of a recording medium a plurality of times;

setting a plurality of different thinning-out mask patterns as thinning-out mask patterns used in the plurality of scans for recording of the same recording area;

thinning out image data using the plurality of different thinning-out mask patterns set in said setting step, each of the plurality of thinning-out mask patterns being used in each of the plurality of scans; and

recording thinning-out images on the same record area in accordance with the image data thinned out in said thinning-out step during each of the plurality of scans, thereby completing an image to be on the same record area,

wherein a print duty of the thinning-out mask pattern to be used when the nozzles including an end nozzle of the print head perform a main scan onto the same record

area is less than a print duty of the thinning-out mask pattern to be used when the nozzles excluding the end nozzle perform another scan onto the same record area, and

wherein each of the different thinning-out mask patterns is defined so that a print duty corresponding to one divided area differs from that corresponding to another divided area in a plurality of divided areas obtained by dividing the same record area in the sub-scan direction different from a main scan direction and a print duty corresponding to a divided area close to the end nozzle is less than that corresponding to a divided area far from the end nozzle in a plurality of divided areas.

42. (New) A recording method according to claim 41, wherein a print duty corresponding to a divided area positioned far from an end nozzle in the thinning-out mask patterns to be used when nozzles including the end nozzle of the print head perform a main scan onto the same record area is confined below a print duty corresponding to a divided area positioned close to the end nozzle in the thinning-out mask patterns to be used when nozzles excluding the end nozzle of the recording head perform the main scan onto the same record area.

REMARKS

Claims 1-42 are pending in this application, of which Claims 1-38 have previously been allowed. Claims 39-42 have been added to provide Applicants with a more complete scope of protection. Claims 1, 2, 11, and 18-38 have been amended to define still more clearly what Applicants regard as their invention. Applicants note that Claims 19-22 have been amended as to matters of form only and those amendments do not narrow the scope of any of those claims. Claims 1, 2, 11, 18-39, and 41 are in independent form.

The changes to independent Claims 1, 11, and 23-38 include adding a feature relating to the print duty or thinning out rate of the thinning out masks to be used in a main scanning operation in which the nozzles including an end nozzle of the print head are used, is less than or greater than the print duty for the same main scan print area or thinning out rate for another thinning out mask to be used in a main scanning operation in which the nozzles excluding the end nozzle are used. Applicants submit that independent Claims 1, 11, and 18-38 are still allowable because each of these independent claims includes the feature of an image forming means or method that uses different respective nozzles of a print head in a plurality of scanning operations, which is one of the features cited in the Reasons for Allowance section of the Notice of Allowance dated April 23, 2002, for allowing the claims.

Applicants submit that new apparatus Claim 39, and corresponding method Claim 41, are allowable at least because they each include the feature of a print duty of the thinning-out mask pattern to be used when the nozzles including an end nozzle of the print head perform a main scan onto the same record area is less than a print duty of the thinning-out mask pattern to be used when the nozzles excluding the end nozzle perform another scan onto the same record area, which is similar to the feature discussed above in Claims 1, 11, and 23-38.

Claim 40 and Claim 42 depend from Claim 39 and Claim 41, respectively, and, therefore, are submitted to be patentable for at least the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, individual consideration of the patentability of each claim on its own merits is respectfully requested.

Applicants' undersigned attorney may be reached in our New York Office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address listed below.

Respectfully submitted,


Attorney for Applicants

Registration No. 47,138

FITZPATRICK, CELLA, HARPER & SCINTO
30 Rockefeller Plaza
New York, New York 10112-3801
Facsimile: (212) 218-2200

NY_MAIN 377419v1